Claims

What is claimed is:

1. A surface plasmon resonance system, comprising:

a support comprising a metal film, a first medium adjacent a first side of the metal film and a second medium adjacent a second side of the metal film;

an illumination source operable to illuminate at least one incident region of the metal film through the first medium;

at least one assay region on the second side of the metal film opposing the incident region; and

a collector operable to collect illumination reflected from the metal film;

wherein at least one of the illumination source and the collector comprise an optical integrated circuit.

2. The surface plasmon resonance system according to claim 1, wherein the optical integrated circuit comprises at least one arrayed waveguide grating spectrometer.

3. The surface plasmon resonance system according to claim 1, wherein the second medium comprises a first member of a binding pair and a second member of a binding pair.

4. The surface plasmon resonance system according to claim 1, wherein the metal film comprises at least about 100 incident regions and at least about 100 corresponding assay regions, the illumination source operable to illuminate the at least about 100 incident regions.

5. The surface plasmon resonance system according to claim 1,

wherein the metal film is comprised within one of a gene chip, a DNA chip, or a protein chip.

6. The surface plasmon resonance system according to claim 3, wherein the first member of a binding pair and the second member of a binding pair are independently selected from the group consisting of antigen, antibody, hormone, hormone receptor, polynucleotide, avidin, streptavidin, biotin, enzyme, enzyme substrate or inhibitor, lectins, specific carboxyhydrate, lipids, lipid binding proteins or membrane associated proteins, polynucleotides, polynucleotide binding proteins, receptor, transmitter, drug, target, protein, small molecule having a molecular weight of about 2,000 or less, polynucleic acid, DNA, and RNA.

7. The surface plasmon resonance system according to claim 3, wherein at least one of the first member of a binding pair and the second member of a binding pair have a molecular weight of about 2,000 or less.

8. The surface plasmon resonance system according to claim 1, wherein the second medium comprises a first member of a binding pair immobilized to the metal film in the assay region.

9. The surface plasmon resonance system according to claim 1, wherein the metal film comprises at least one of gold, silver, aluminum, and molybdenum, and the first medium comprises at least one of a plastic, borosilicate glass, phosphosilicate glass, and silica glass.

10. A method of monitoring a binding event, comprising:

illuminating a metal film through a first medium adjacent one side of the metal film, an assay medium comprising a first member of a binding pair

immobilized on a second side of the metal film;

contacting the first member of a binding pair with a second member of a binding pair;

collecting illumination reflected from the metal film; and

analyzing properties of the collected illumination; wherein at least one of illuminating the metal film and collecting illumination comprises using an optical integrated circuit.

11. The method according to claim 10, wherein illuminating the metal film comprises using light having a wavelength from about 390 nm to about 2,500 nm.

12. The method according to claim 10, wherein at least about 225 assay media each comprising a first member of a binding pair are immobilized on the second side of the metal film.

13. The method according to claim 10, wherein analyzing properties of the reflected light determines at least one of a) measuring an amount of the second member of a binding pair bound to the first member of a binding pair in the assay, b) whether or not binding occurs between the first member of a binding pair and the second member of a binding pair, and c) distinguishing between specific and non-specific binding between the first member of a binding pair and the second member of a binding pair.

14. The method according to claim 10, wherein the optical integrated circuit uses a 2 x N optical switch to directing light at the metal film.

15. The method according to claim 12, wherein the assay media each have a volume of about 0.5 μL or less.

16. The method according to claim 10, wherein at least one of the first member of a binding pair and the second member of a binding pair have a molecular weight of about 2,000 or less.

17. The method according to claim 10, wherein the first member of a binding pair and the second member of a binding pair are independently selected from the group consisting of antigen, antibody, hormone, hormone receptor, polynucleotide, avidin, streptavidin, biotin, enzyme, enzyme substrate or inhibitor, lectins, specific carboxyhydrate, lipids, lipid binding proteins or membrane associated proteins, polynucleotides, polynucleotide binding proteins, receptor, transmitter, drug, target, protein, small molecule having a molecular weight of about 2,000 or less, polynucleic acid, DNA, and RNA.

18. A microwell array for a surface plasmon resonance system, comprising:

a silicon substrate comprising a plurality of wells to accommodate an interaction between a first member of a binding pair and a second member of a binding pair;

a metal layer coupled to the silicon substrate so as to be positioned at the bottom of the wells;

an insulation layer adjacent the metal layer;

an optical integrated circuit connected to the insulation layer, the optical integrated circuit comprising at least one arrayed waveguide grating spectrometer and at least one optical switch, the optical integrated circuit configured to illuminate each of the plurality of wells.

19. The microwell array according to claim 18, wherein the silicon substrate comprises at least about 400 wells.

20. The microwell array according to claim 18, wherein the plurality of wells independently comprise at least one selected from the group consisting of antigen, antibody, hormone, hormone receptor, polynucleotide, avidin, streptavidin, biotin, enzyme, enzyme substrate or inhibitor, lectins, specific carboxyhydrate, lipids, lipid binding proteins or membrane associated proteins, polynucleotides, polynucleotide binding proteins, receptor, transmitter, drug, target, protein, small molecule having a molecular weight of about 2,000 or less, polynucleic acid, DNA, and RNA.

21. The microwell array according to claim 18, wherein the metal film comprises at least one of gold, silver, aluminum, and molybdenum, and the first medium comprises at least one of a plastic, borosilicate glass, phosphosilicate glass, and silica glass.

22. The surface plasmon resonance system according to claim 1, wherein the optical integrated circuit comprises an integrated optical switch.

23. The method according to claim 10, wherein the optical integrated circuit comprises an integrated optical switch.